

# **R&D Opportunities in Solid State Lighting**

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James R. Brodrick Ph.D.

US Department of Energy

Office of Energy Efficiency and Renewable Energy,  
Buildings Technologies Program



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# Building Technologies Program

## Lighting R&D Program Mission Statement

To increase end-use efficiency in buildings by aggressively researching new and evolving lighting technologies, in close collaboration with partners, to develop viable methodologies that have the technical potential to conserve 50% of electric lighting consumption by 2010.

- Over 12 years of investing in Research & Development
- DOE supports over \$6 million per year in lighting R&D
- Focal point for solid state lighting at DOE



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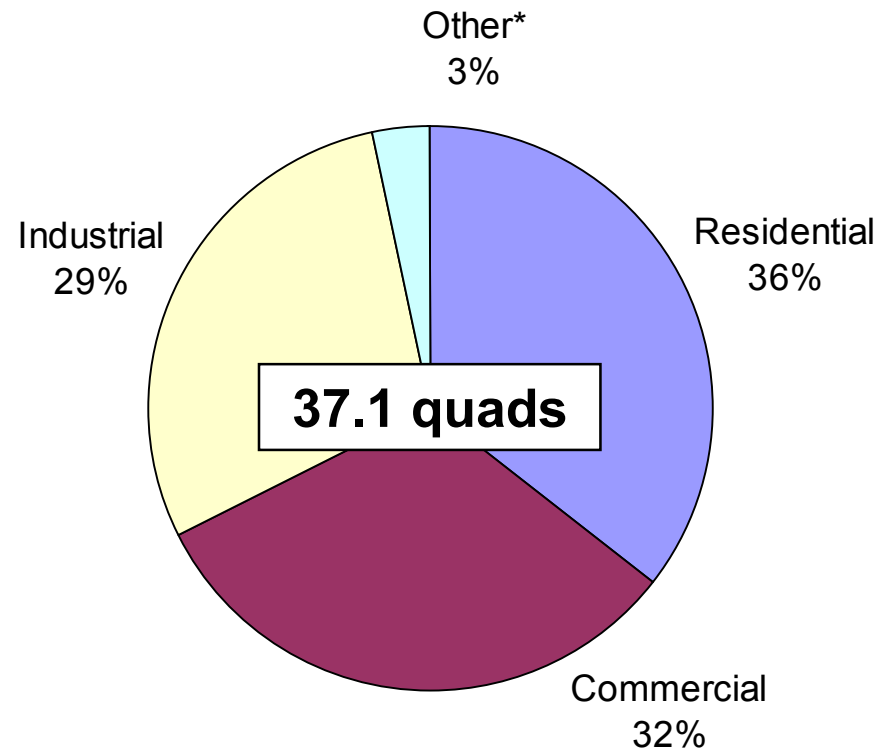
Solid State Lighting R&amp;D Overview

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R&amp;D Opportunities

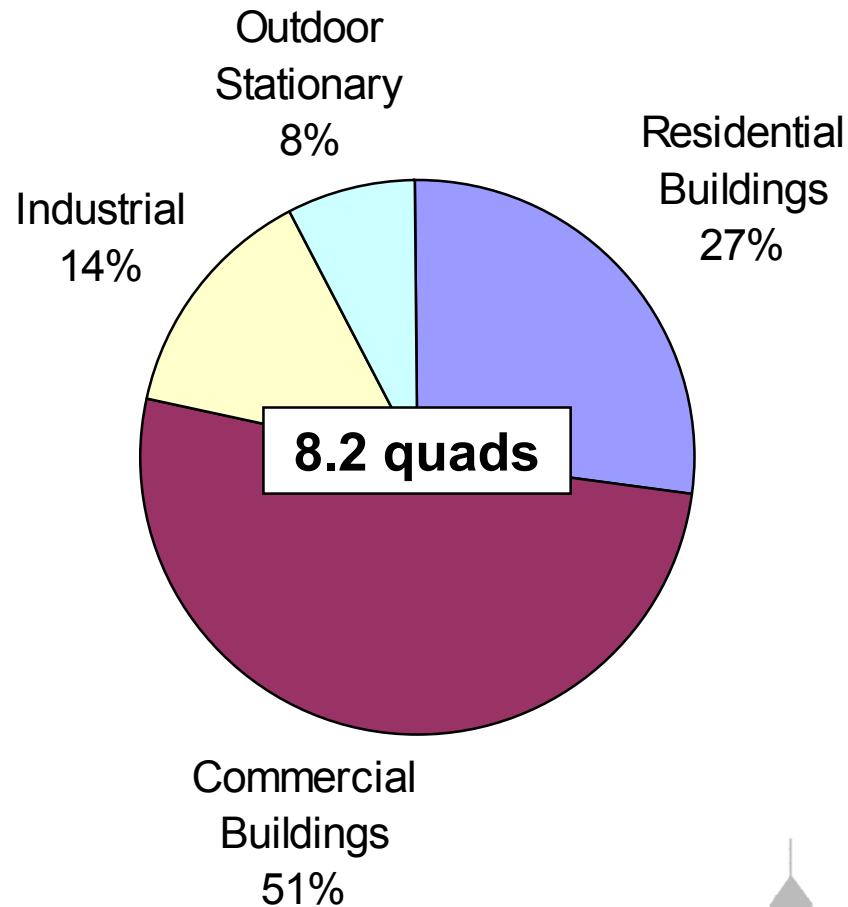


# Total US Consumption of Energy for Electricity, 2001



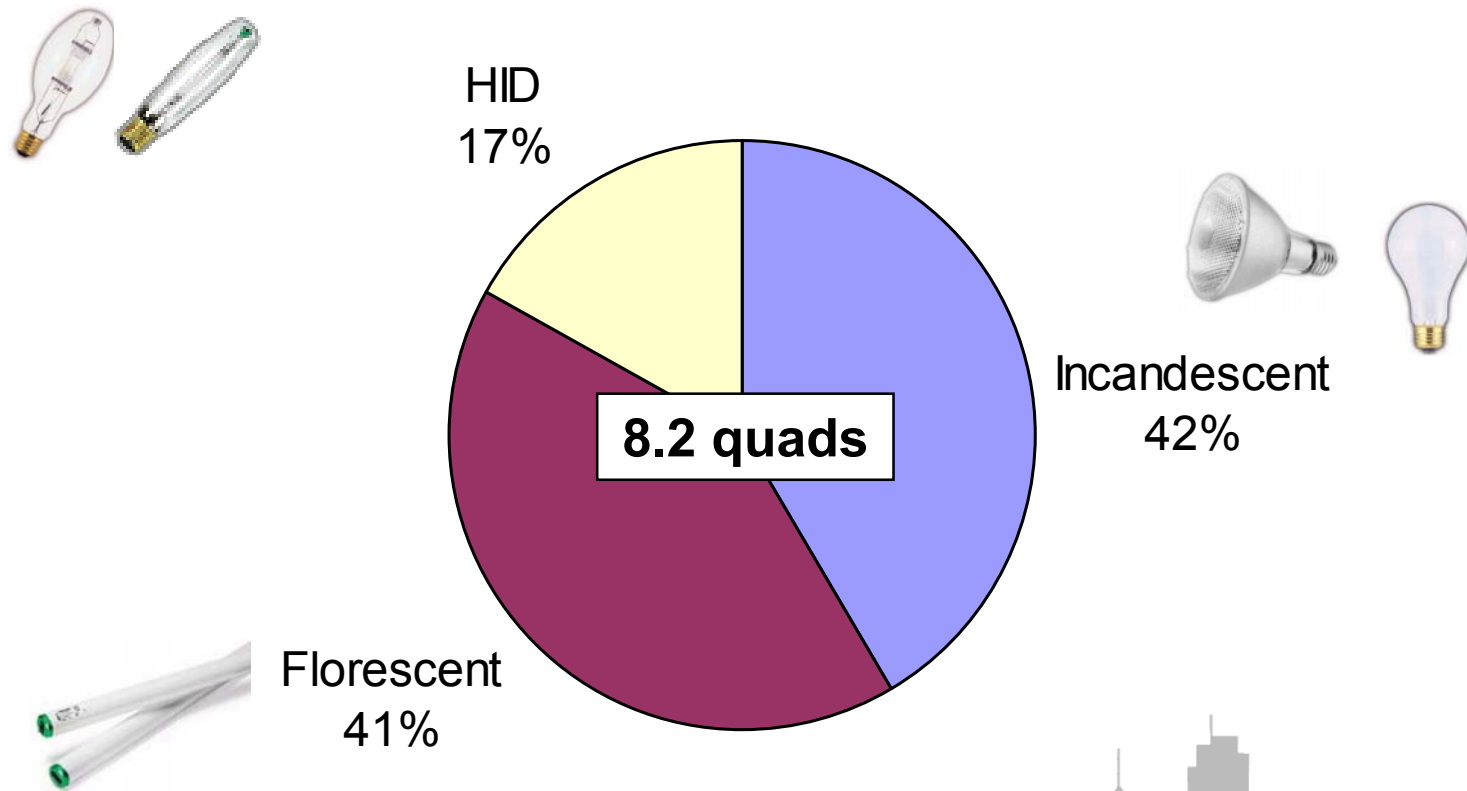
*\* Other includes electricity for street lighting, public authorities, railways, irrigation, and interdepartmental sales.*

# Energy Consumption for Lighting by Building Sector, 2001



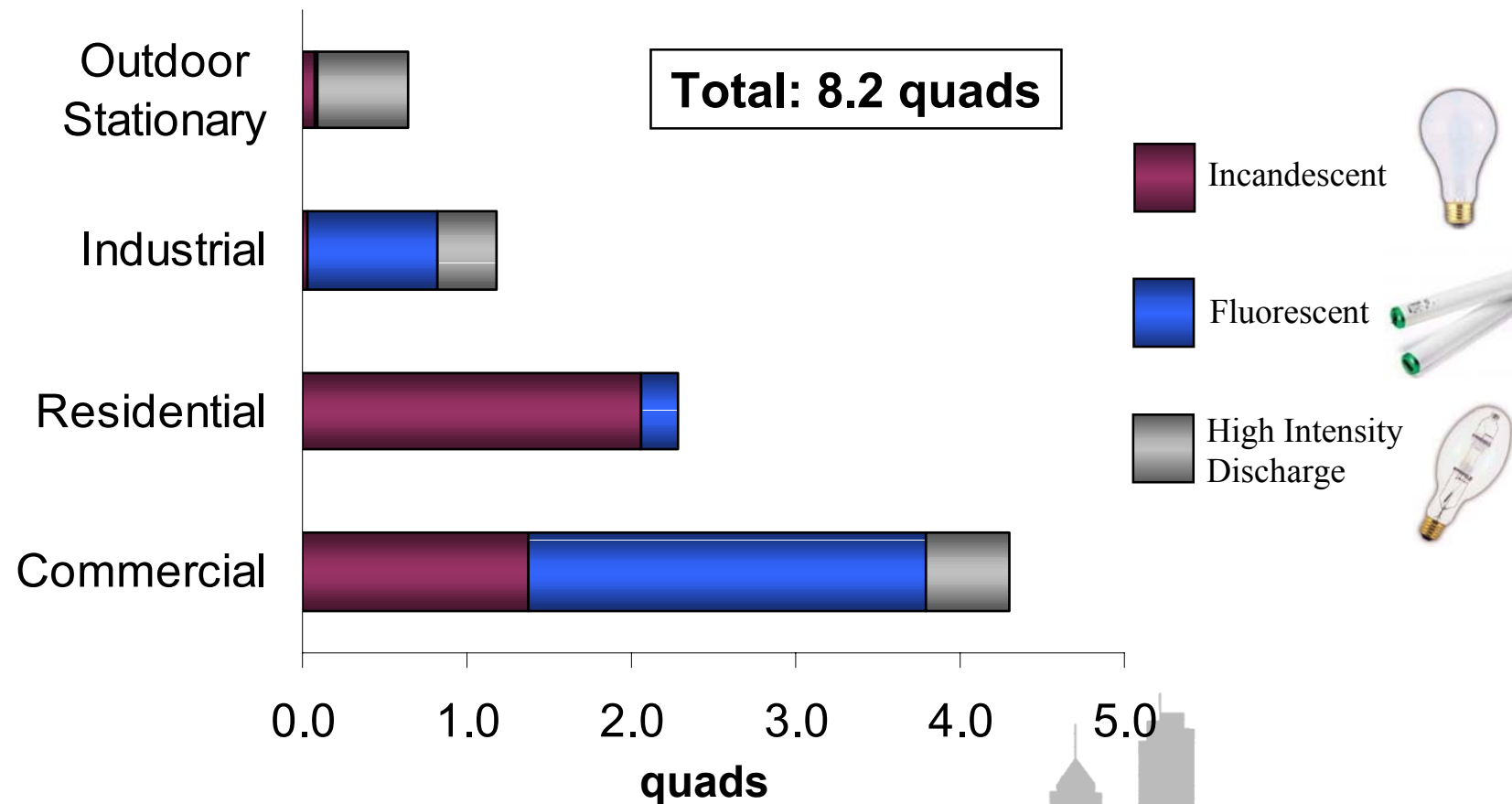
*Quantity of primary energy consumed to provide electricity for lighting in each of these four sectors.*

# Energy Consumption for Lighting by Source

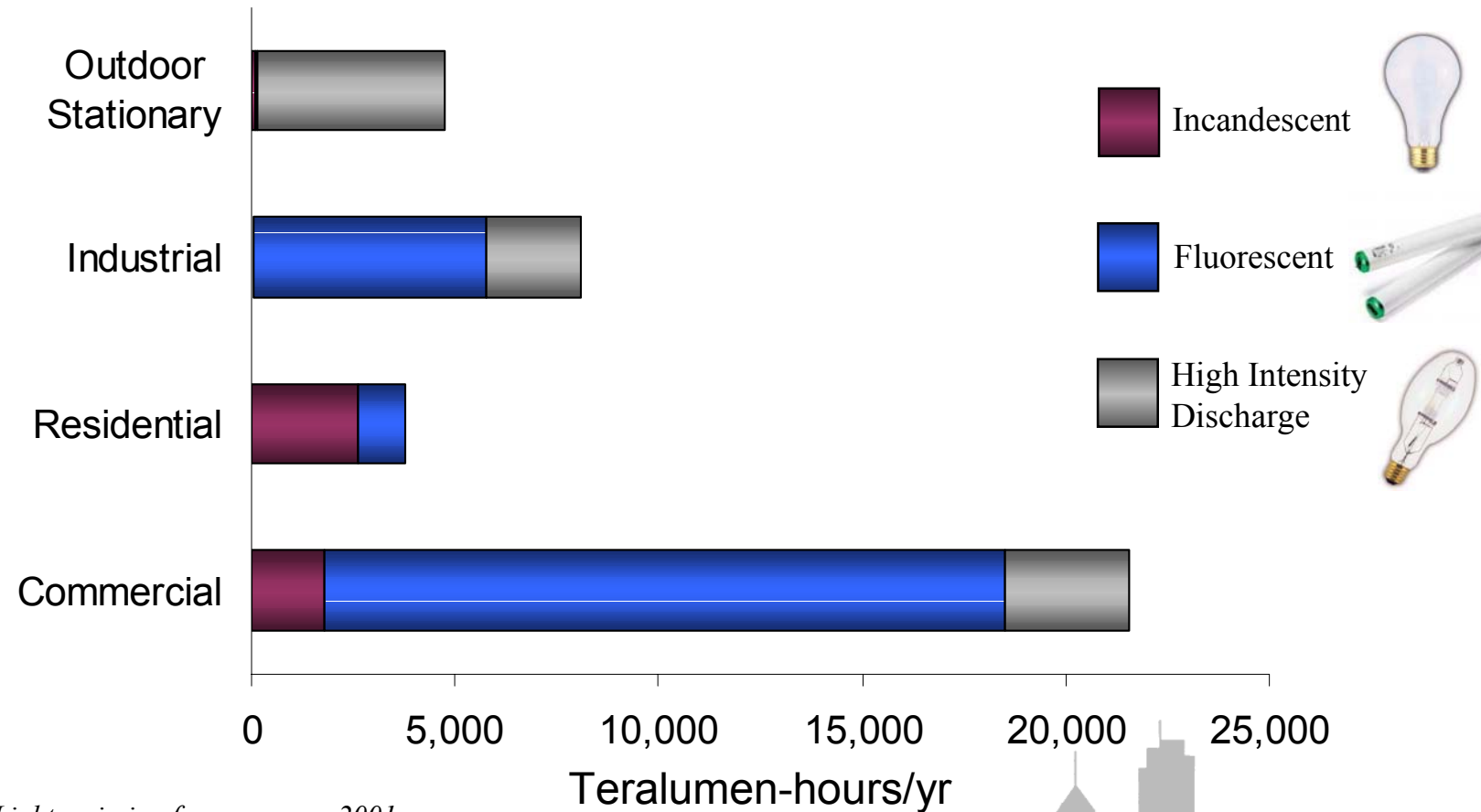


\* Note: Solid state light sources were also considered in this analysis, however due to the low level of penetration into the general lighting market and its relative efficiency, its contribution is less than one half of one percent.

# Lighting Energy Use by Sector and Source

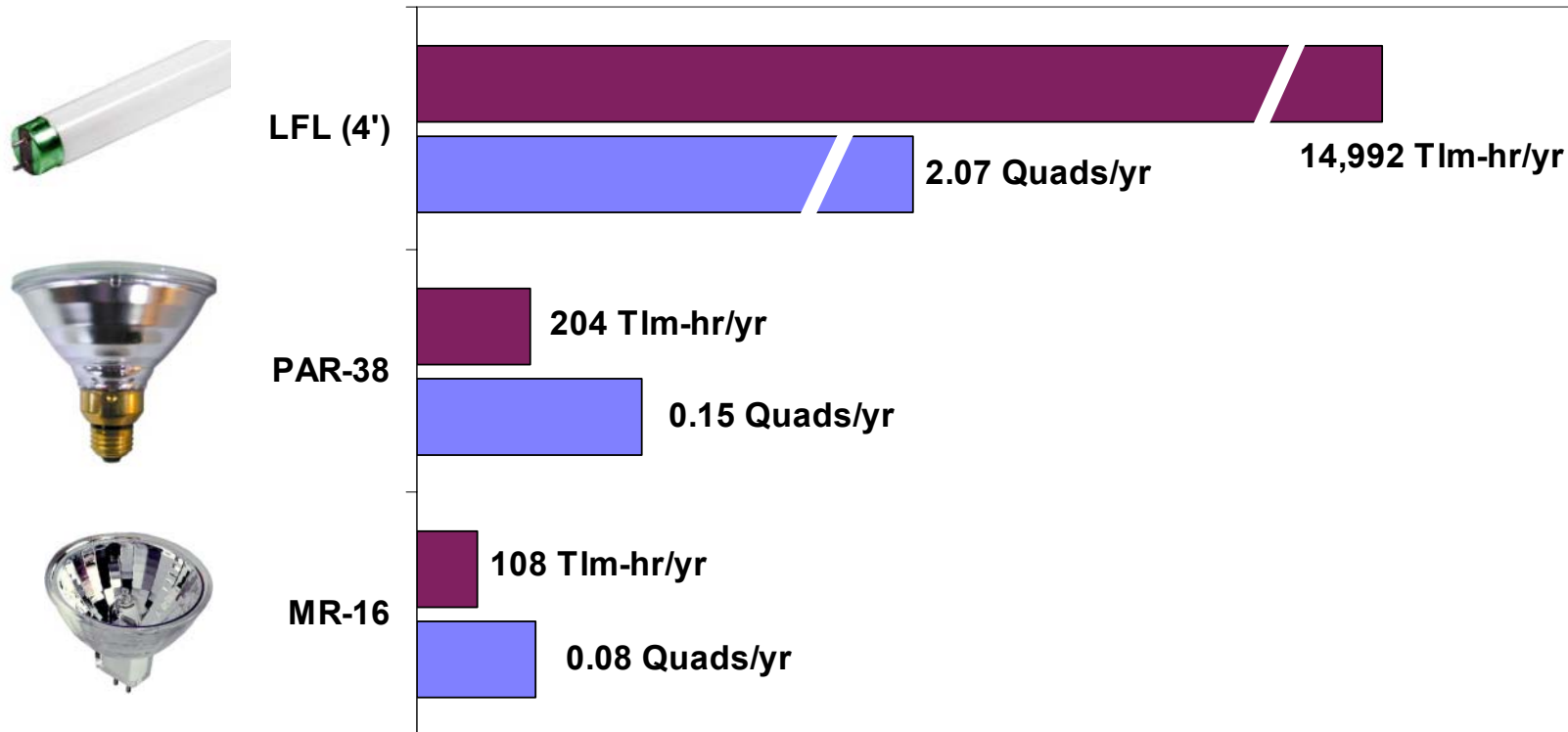


# Source Light Production, by Sector and Source, 2001



*Light emission from sources, 2001.  
Does not consider fixture efficiency.*

# Comparison of Site Energy and Source Light Production



Lighting Market Characterization, Phase I: Lighting Inventory and Energy Consumption Estimate  
is available on the web: <http://www.eren.doe.gov/buildings/documents>

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# Road Map Technical Objectives

- **Quantum Efficiency** - Internal and External.
  - Efficiently produce & extract desirable photons from electron-hole pairs with minimum heat production.
- **Lifetime**
  - Understand degradation & failure mechanisms to extend practical lifetimes of devices to make them as life cycle cost beneficial as possible.
- **Stability**
  - Basic material properties & processes that impact color & control.



# Road Map Technical Objectives (continued)

## ➤ Packaging

- Design devices into practical packages that satisfy marketing and manufacturing goals.

## ➤ Infrastructure

- Marketing, sales, installation and support.

## ➤ Cost

- Reduce cost of production to encourage competition with existing sources.



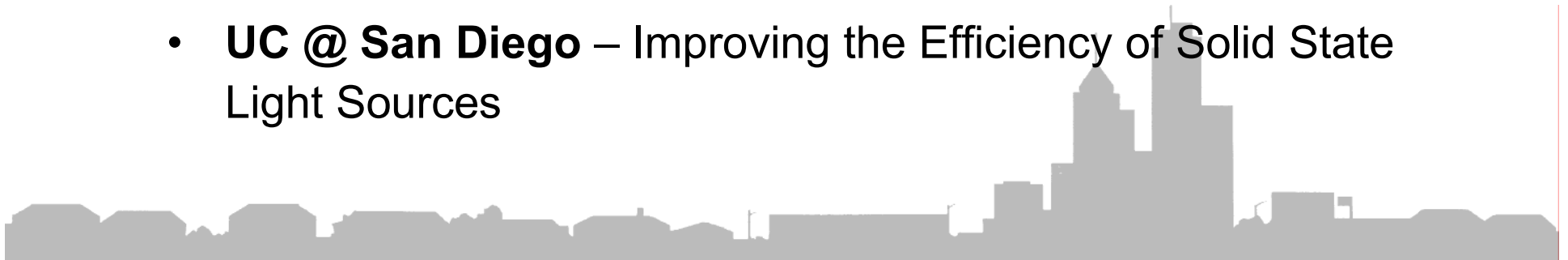
# SSL Projects – FY2003

## BT / NETL

- **Cree Lighting Company** – White Light Emitting Diode Development for General Illumination Applications
- **General Electric** – Organic Light Emitting Diodes for General Lighting
- **LumiLeds Lighting** – Development of Key Technologies for White Lighting Based on LEDs

## EESI

- **UC @ Santa Barbara** - High Efficiency Nitride-Based Solid State Lighting
- **UC @ San Diego** – Improving the Efficiency of Solid State Light Sources



# SSL Projects – FY2003

## SBIR

- **Universal Display Corporation** – Monomer-Excimer Phosphorescent White OLEDs
- **Universal Display Corporation** – White Illumination Sources Using Stripped Phosphorescent OLEDs
- **Intelligent Optical Systems, Inc.** – General Illumination Using Dye-Doped Polymer
- **Maxdem, Inc.** – New Solid State Lighting Materials



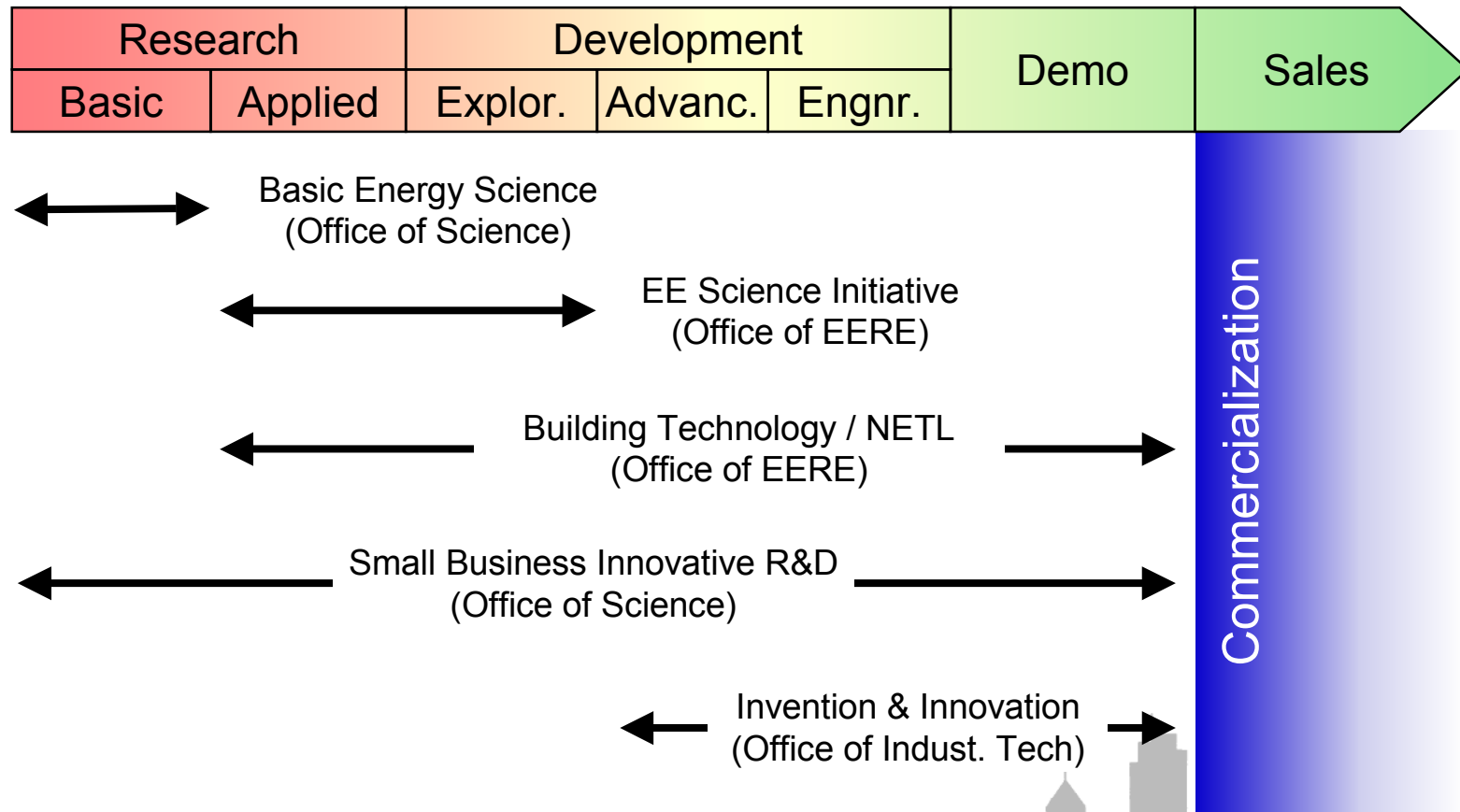
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# DOE Funding Opportunities

## *Technology Maturity Continuum*



# DOE Funding Opportunities

- Office of Science, Annual Solicitation Process  
<http://www.sc.doe.gov/production/grants/fr02-01.html>
- FY2002 Joint Office of Energy Efficiency and Renewable Energy and Office of Fossil Energy Science Initiative  
<http://www.netl.doe.gov/business/>
- Office of Energy Efficiency and Renewable Energy, Energy Efficient Building Equipment and Envelope Technologies IV  
<http://www.netl.doe.gov/business/>
- Office of Science, Small Business Innovative R&D  
<http://sbir.er.doe.gov/sbir>
- Office of Industrial Technology, Invention and Innovation  
<http://www.oit.doe.gov/inventions/>



## New SSL Opportunities in FY2003

BT/NETL	<ul style="list-style-type: none"><li>• OPEN *</li><li>• All Lighting Technologies</li></ul>
Status of NGLI	<ul style="list-style-type: none"><li>• U.S. Senate Bill 167 and HR 238</li><li>• Interior Appropriation Bill – FY'03</li></ul>

\* For information on the BT/NETL Solicitation, visit the following website:  
<http://www.eps.gov/spg/DOE/PAM/HQ/DE-PS26-03NT41635/SynopsisP.html>

